

The Bioinformatics Lab

Databases and  MySQL®

27.06.2011

Outline

- Presentation of results from last week

Web Server: Apache, CGI, PHP

by Markus Meier

- Short introduction to MySQL
- Starting the programming challenge

Why Databases Are Better Than Files?

- They manage tremendous amount of data
- Provide uniform interfaces
- Increase performance
- Encourage integrity

BUT

Databases are NOT a cure for all

=> They must be used properly to be useful!

Relational Databases

- Organize large amounts of data
- Are made of *relations*, more commonly called *tables*
- Each column in the table has a unique name
- The columns are called fields or attributes
- Each row has the same attributes and represents one unique record
- The tabs are referenced to each other by identifying columns, also called *keys*
- NULL values are allowed when data are not known or not relevant. Zeros are 'empty' not the same as NULL
 - Keys cannot be NULL

RDBMS

- A relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model

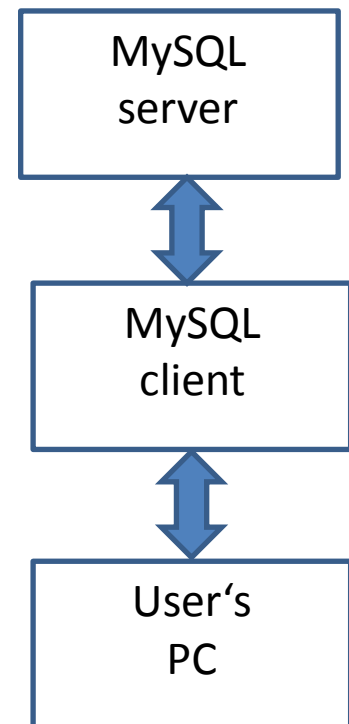
- List of DBMS:

4th Dimension * Adabas D * Alpha Five * Apache Derby * BlackRay * CA-Datcom * CSQL * CUBRID *
Daffodil database * DataEase * Dataphor * DB-Fast * Derby aka Java DB * ElevatedDB * Empress
Embedded Database * EnterpriseDB * EffiProz * eXtremeDB * fastDB * FileMaker Pro * Firebird *
FrontBase * Gladius DB * Greenplum * H2 * Helix database * SQLDB * IBM B2 * WCE SL Plus * IBM DB
Express-C * Inormix * Ingres * InteBase * InterSystems Caché * Kognitio * Linter * MaxDB * Mckoi SQL
Database * Microsoft Access * Microsoft Jet Database Engine (part of Microsoft Access) * Microsoft SQL Server
* Microsoft SQL Server Express * Microsoft Visual FoxPro * Mimer SQL * MonetDB * mSQL * **MySQL** *
Netezza * NonStop SQL * Openbase * OpenLink Virtuoso (Open Source Edition) * OpenLink Virtuoso Universal
Server * Oracle * Oracle Rdb for OpenVMS * Panorama * Pervasive * **PostgreSQL** * Progress 4GL *
RDM Embedded * RDM Server * The SAS system * Sav Zigzag * ScimoreDB * SmallSQL * solidDB *
SQLBase * SQLite * Sybase Adaptive Server Enterprise * Sybase Adaptive Server IQ * Sybase SQL Anywhere
(formerly known as Sybase Adaptive Server Anywhere and Watcom SQL) * tdbengine * Teradata * TimesTen *
txtSQL * UniData * UniVerse * Valentina (Database) * Vertica * VistaDB * VMDS * XSPRADA

Why MySQL?



- RDBMS
- Uses Structural Query Language (SQL)
- Open Source Software
- Client/server architecture
- Wide range of MySQL API's available
(Perl, Java, PHP, Python, Ruby, C++, etc.)
- + ODBC interface for accessing DBMS
- Fast, reliable and easy to use
- Desktop software and web applications available
(e.g. MySQL Navigator or phpMyAdmin)
- <http://www.mysql.com/>



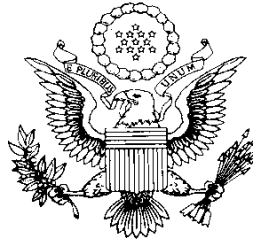
Structured Query Language (SQL)

- SQL is the language used to work with modern relational databases
- It provides the programming syntax (language) to communicate with (query) the database and its tables
- Like English, an SQL statement is made up of subjects, verbs, and predicates
- “SELECT * FROM state WHERE stateid = 32”

A Little Bit of History...


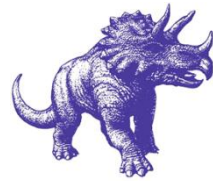


contracted with



to help with



- Collaboration with  => 1968: Information Management System (IMS)
- Innovations of IMS: Logical data organization & Data Language/I (DL/I)
=> Hierarchical data organization
- 1971: CODASYL Conference:
=> standardized the programming language 
=> allowed to model data as a network in IMS

COBOL

A Little Bit of History – SQL ...

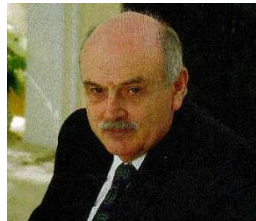
- Charles Bachman



invented „Bachman Diagrams“

=> 1973: Turin Award

- Edgar F. Codd



published „A Relational Model of Data for

Large Shared Data Banks“, *ACM Journal*, 1970

=> 1981: Turin Award

- From this work IBM's System R arose and the language Structured English Query Language (SEQUEL)

Sequel

- 1986:



created an official standard

A Little Bit of History – MySQL ...

- 1994: a PhD student David J. Hughes (a.k.a. Bambi) developed mSQL

⇒ Translated SQL to PostQUEL to access to Postgres databases

- Michael Widenius (a.k.a. Monty)
 - wanted to add SQL as interface on his database that he had been developing for 15 years at TCX DataConsult AB.
 - he couldn't interest David J. Hughes
 - reimplemented SQL
 - May 1995: First release of MySQL




MySQL Administration

- MySQL is primarily an RDBMS and therefore ships with NO GUI tools to administer MySQL databases or manage data contained within.
 - Users may use the included command-line tools: e.g. mysql, mysqladmin
 - Or download MySQL frontends from various parties that have developed desktop software and web applications to manage MySQL databases, build database structure, and work with data records.
- **phpMyAdmin** - a free Web-based frontend widely installed by Web hosts worldwide, since it is developed in PHP and only requires the LAMP stack.
- HeidiSQL - a full featured free frontend that runs on Windows, and can connect to local or remote MySQL servers to manage databases, tables, column structure, and individual data records.
- MySQL Admin – a simple free MySQL frontend written in one PHP script
- Navicat - a series of proprietary graphical database management applications, developed for Windows, Macintosh and Linux

Today's Programming Challenge

- Install and configure a MySQL Database server.
 - There should be a user with '*your name*' and a database with '*your name_db*'
 - Only the user should have access to the database from localhost.
- Create your own database and fill a table with some data.
 - For example use PHP or Perl
- Create a backup from your database.
- Install phpMyAdmin to provide a nice web-based interface for the users.

See  Hints and Tips in the oWiki

Next Week is MySQL Test!

- 20 multiple choice and 3 bonus questions
- 30-35 mins
- You are allowed to use computer and the internet
- Example questions in the oWiki